

**ABSTRACT**

An excited surfactant species is created by generating plasma discharge in a surfactant precursor gas. A surfactant species typically includes at least one of iodine, led, thin, gallium, and indium. A surface of an integrated circuit substrate  
5 is exposed to the excited surfactant species to form a plasma-treated surface. A ruthenium thin film is deposited on the plasma-treated surface using a CVD technique.